

(12) UK Patent Application (19) GB (11) 2 342 010 (13) A

(43) Date of A Publication 29.03.2000

(21) Application No 9915199.5

(22) Date of Filing 30.06.1999

(30) Priority Data

(31) 09107640 (32) 30.06.1998 (33) US

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(51) INT CL⁷

H04B 7/005 , H04Q 7/30 7/32 7/38

(52) UK CL (Edition R)

H4L LDH LDSM LECTX L1H10 L1H14 L1H3

(56) Documents Cited

JP 620222723 A JP 050252097 A US 5592533 A

(58) Field of Search

UK CL (Edition R) H4L LDH LDSM LECTS LECTX
INT CL⁷ H04B 7/005 , H04M 1/72 , H04Q 7/30 7/32
7/38

ONLINE: WPI, JAPIO, EPODOC

(54) Abstract Title

Reducing transmission power to provide secure registration within an in-home wireless network

(57) Method and apparatus for secure registration of an access device 604 with a base station 602, for example, for secure registration of devices such as telephones, televisions, computers, thermostats and refrigerators in an in-home wireless network, involves the base station reducing its operational power level to a lower registration power level during registration, thus ensuring secure registration for a device brought close to the base station. The access device 604 and the base station 602 each have a receiver and a transmitter transmitting at an operational power level. Once registration has been initiated, either by the base station or device, the base station switches its r.f. transmitter from a relatively high power operational state 606, to a relatively low power registration state 608, transmits a registration signal 612 to the device, receives a response 616 and then restores its power level to the operational state 618. The access device may similarly reduce its operational power level to a registration power level to transmit a registration signal (figure 7). Conventional encryption may be used and transmitter power reduction may be achieved by switching in a load (222, figure 2) during registration.

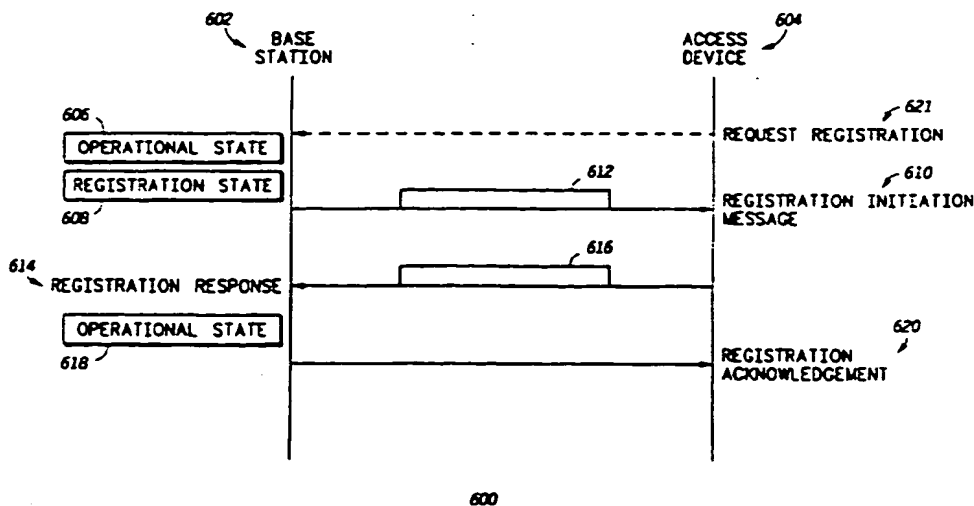
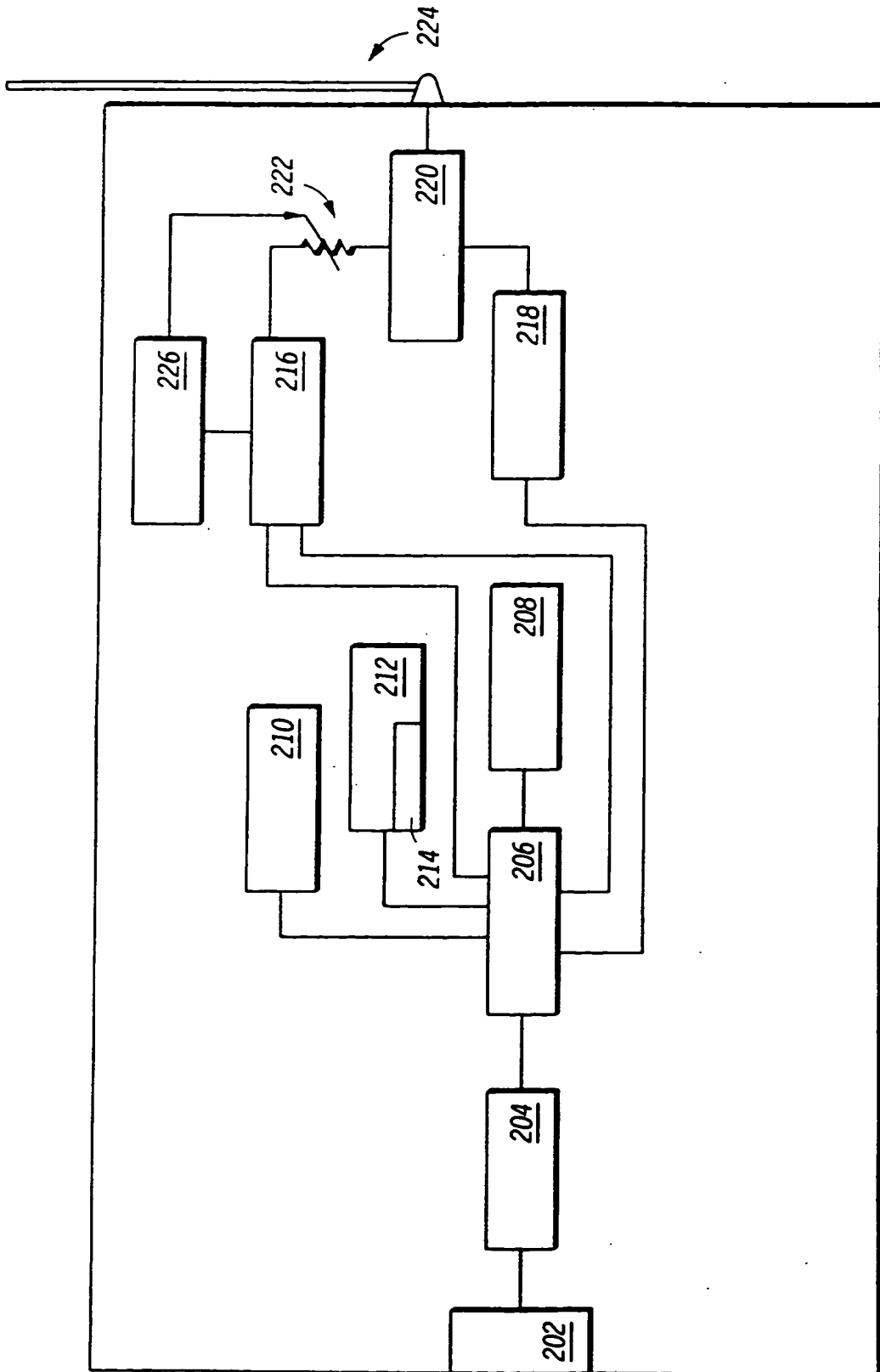
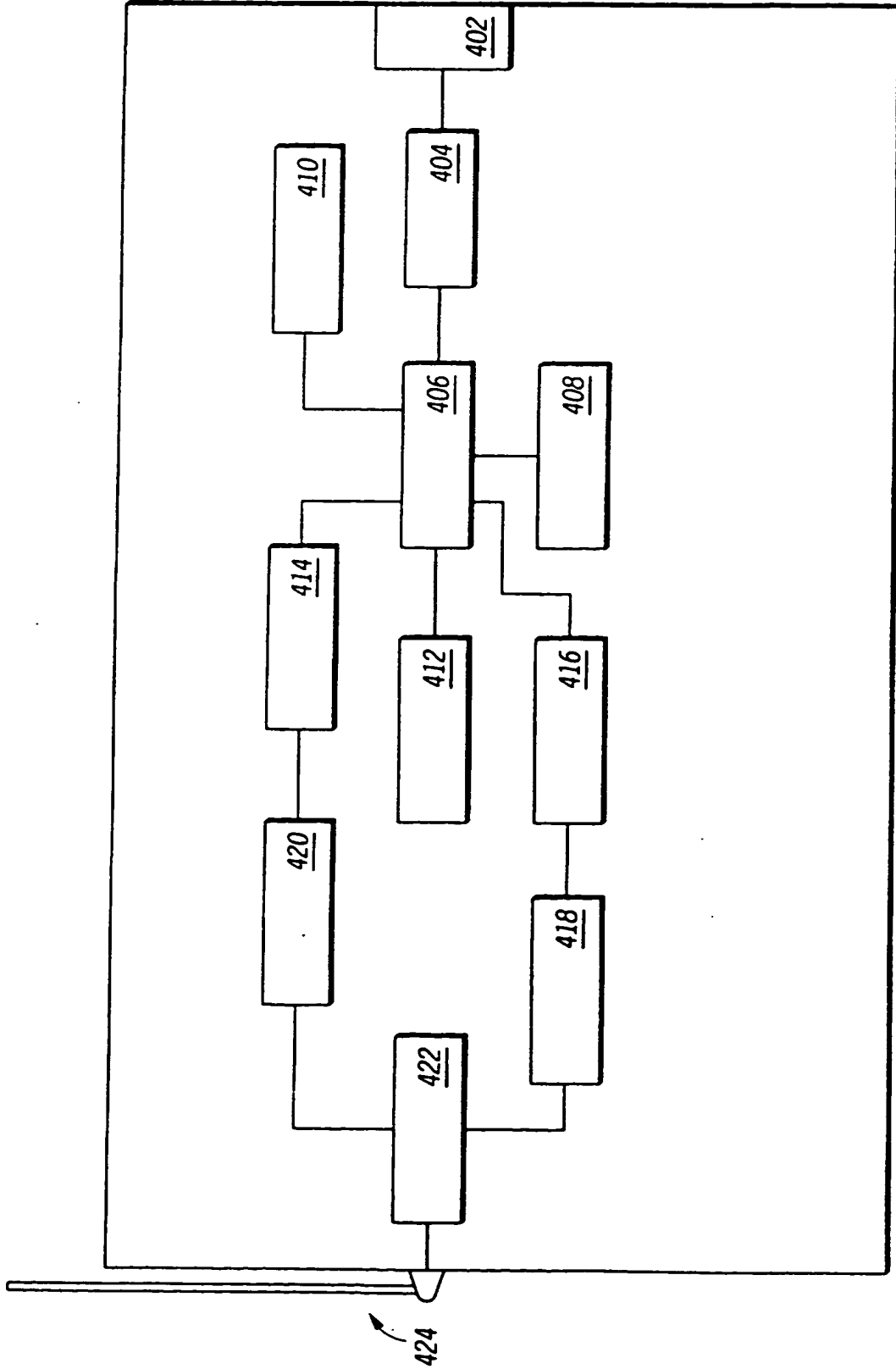


FIG.6

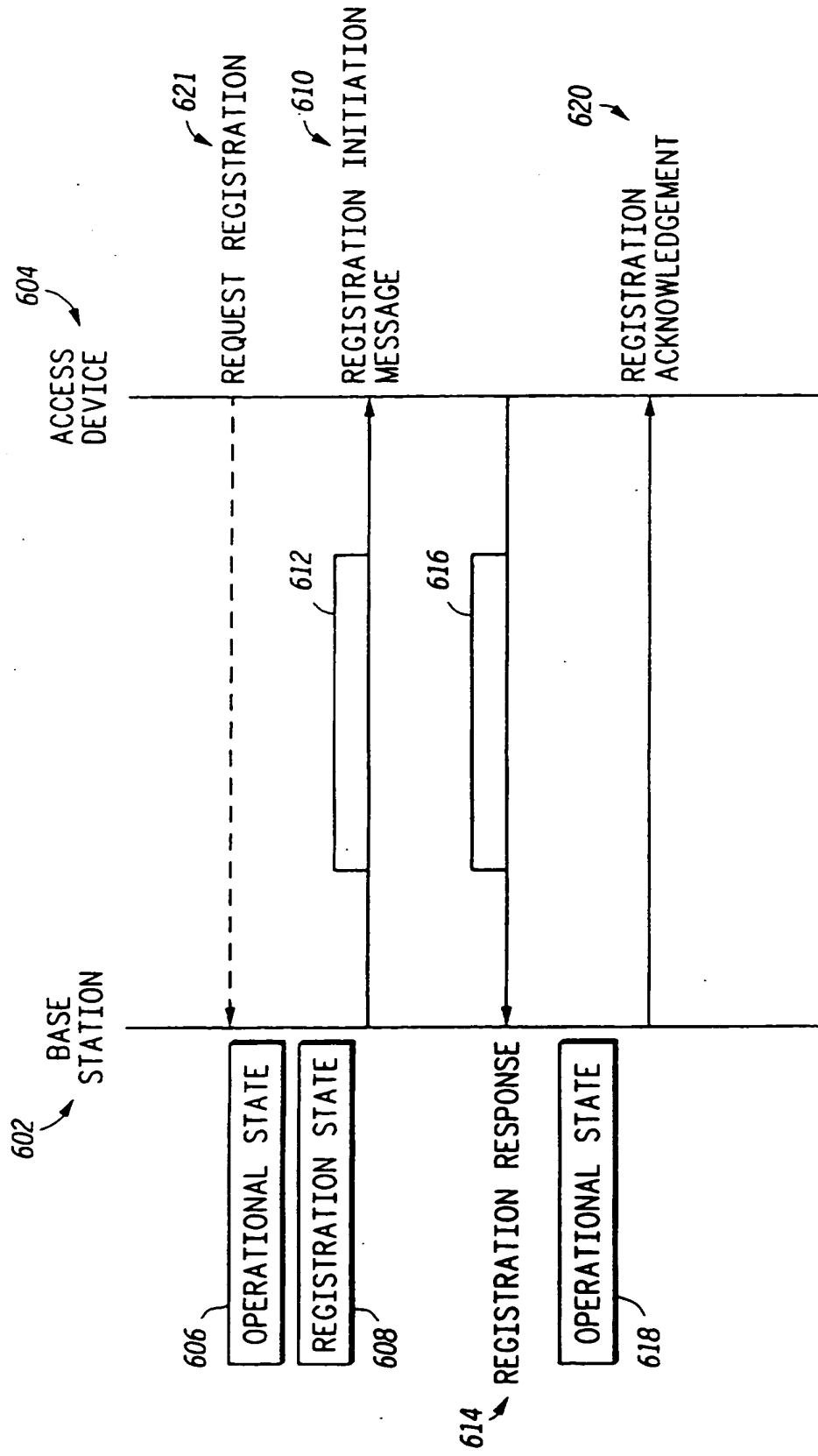
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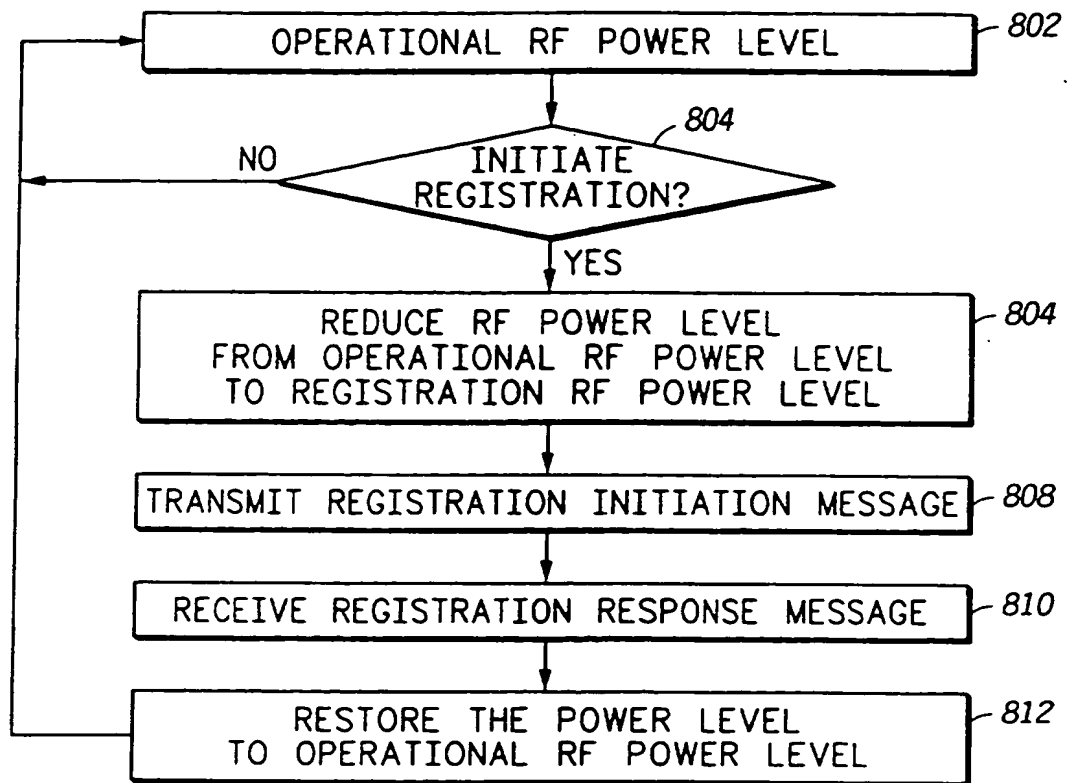
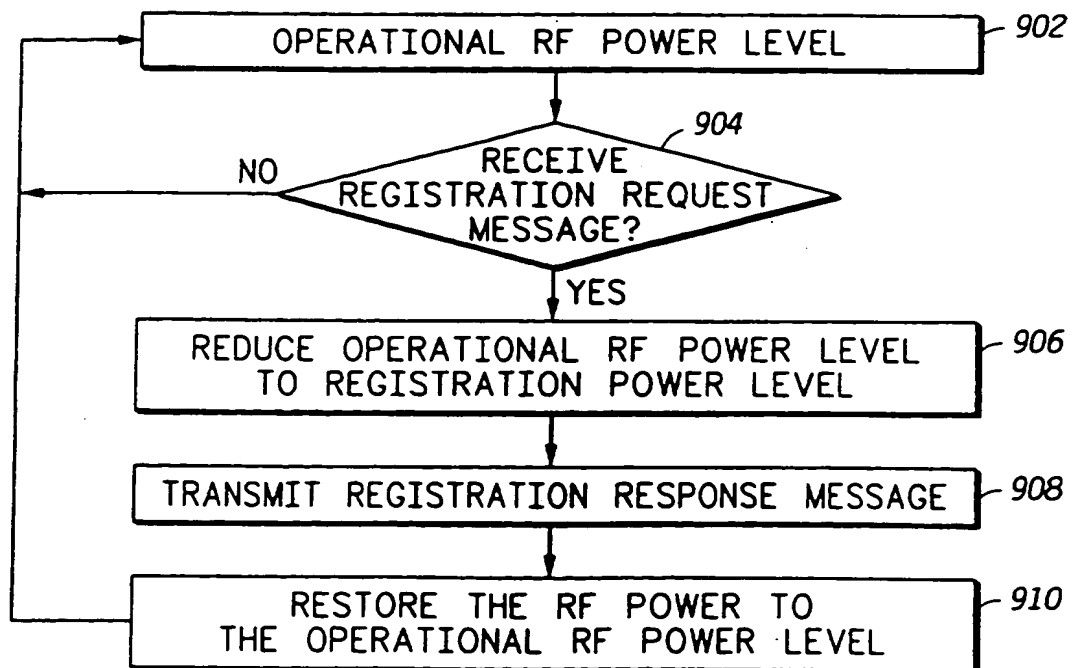
200*FIG. 2*



400

FIG. 4

600*FIG. 6*

800*FIG. 8*900*FIG. 9*

identification code for a device is high. With the possibility of multiple wireless in-home networks operating within the same house, an input error could result in a device not communicating or the base

5 communicating with a wrong device. In addition to the possibility of error in data that is input by a consumer, there is the added cost and complexity of having a network management console for entering the identification codes for different devices.

10 Furthermore, the cordless phone method of registering a base station with a handset by placing the handset in a cradle connected to the base station has problems of scalability and connectivity. A cradle is designed for one type of device only. In an in-home wireless

15 network, a diverse number of consumer devices may be connected on the network. The devices can include refrigerators, stereo receivers, telephones, computers, and thermostats to name only a few. A cradle for a phone would not be suitable for a computer or stereo.

20 Another problem with the cordless phone's method of registration is physical contact between the base station and handset. Once again, this method would be impractical with a diverse group of consumer products and require additional circuitry for supporting a

25 physical connection to a base station. Neither of the methods discussed above addresses the need to securely

accordance with a preferred embodiment of the invention.

FIG. 7 is a message ladder diagram showing an access device sending a registration message at low power in accordance with a preferred embodiment of the invention.

FIG. 8 is a flow diagram of a method of active registration in accordance with the preferred embodiment of the invention.

FIG. 9 is a flow diagram of a method of passive registration in accordance with the preferred embodiment of the invention.

Detailed Description of the Preferred Embodiment

The present invention provides a method and apparatus for secure registration of a device within an in-home wireless network. The apparatus has a transmitter capable of transmitting at a relatively high RF power level during normal operations and a relatively low RF power level when registering with a second device or base station. The apparatus or base station may be configured to initiate registration in a number of ways as discussed below.

Referring to FIG. 1, a diagram of an in-home wireless network residing within a single room 100 in accordance with a preferred embodiment of the

memory address for temporary identification numbers 214. The CPU 206 may also have a hard disk drive 208 for storage of software programs and large amounts of data.

5 The CPU 206 also has connections to a RF encoder 216 and a RF decoder 218 for generating and receiving RF signals. The RF encoder 216 and RF decoder 218 are coupled to a RF splitter 220 that is connected to an antenna 224. The CPU 206 also has a second source
10 connected to the RF encoder 216 that activates the registration power control. RF encoder 216 is connected to a controller 226 that controls a load 222 which switches the RF power output of the base station 200.

15 The base station 200 normally transmits at a relatively high RF power level so all devices in an in-home network can receive transmissions from the base station 200. The base station 200 receiving a registration request message can initiate the
20 registration of an access device with a base station 200. The registration request message is received through the antenna 224 and routed to the RF decoder 218 by the RF splitter 220. The CPU 206 then processes the registration request message. An alternative way of
25 initiating registration would have the base station 200 at fixed intervals attempt to register all devices located next to the base station 200.

CPU 206. The CPU 206 will then use the temporary identification number stored at an address 214 in RAM 212 to authenticate the data. If the received data is encrypted, the CPU 206 will use an encryption key stored in the secure memory 210 to decrypt and then authenticate the message. If the authentication of the data proves to be from the access device that requested to register, the CPU 206 will store a permanent identification for the access device in a database located in RAM 212 and on the hard disk 208, if a hard disk is present.

In FIG. 3, a block diagram of a base station 300 having a switch interface in accordance with a preferred embodiment of the invention is shown. The base station 300 has all the elements of base station 200 as described above with the additional element of a switch 302 connected to the CPU 206. Registration is initiated in this embodiment of the invention by activating switch 302, which causes the CPU 206 to start the process of sending a registration message to an access device as described above in FIG. 2.

FIG. 4 is a block diagram of an access device 400 in accordance with a preferred embodiment of the invention. The access device 400 has a data input/output port 402 for sending and receiving data. The input/output port 402 is connected to a data buffer 404 that is also connected to a CPU 406. The CPU 406

sends a RF signal that is not modulated to the RF decoder 416. The RF decoder 416 decodes the unmodulated RF signal into data that the CPU 406 will recognize as a registration request message.

5 If the access device uses encryption and authentication for added security during registration, the CPU 406 will store the authentication data received in the RAM 408 and apply any encryption algorithms, which are stored in ROM 410, required for secure
10 communications with the base station 200. A person skilled in the art of data communications commonly knows encryption and authentication methods.

 The CPU 406, in response to a registration message, will send a registration response message
15 containing a unique identification for the access device 400. The CPU 406 will apply the appropriate encryption and authentication data to the registration response message if so required. The registration response message is sent from the CPU 406 to the RF
20 encoder 414. The RF encoder 414 encodes the data into a RF unmodulated signal. The RF unmodulated signal is then sent from the RF encoder 414 to the RF transmitter 420. The RF transmitter combines the RF encoded signal with a RF carrier that is then sent through a RF
25 splitter 422 and out over the air via the antenna 424.

 Turning to FIG. 5, a block diagram of an access device 500 having a switch interface 502 and RF power

the transmitted RF signal power level is reduced from the operational state 606. The base station 602 transmits a registration initiation message 610 containing registration data 612 to the access device 5 604.

Upon receiving the registration initiation message 610, the access device 604 responds with a registration response message 614. The registration response message 614 contains response data 616 for the base 10 station 602. The base station 602 changes to the operational state 618 and registration of the access device is complete.

The base station 602 may send a registration acknowledgement message 620 which can be used by the 15 access device 604 to notify a consumer that the access device 604 has been registered. An alternate approach of initiating registration would have the access device 604 sending a request for registration message 621 to the base station 602.

20 FIG. 7 is a message ladder diagram 700 showing an access device 702 sending a registration data message 718 at low power in accordance with a preferred embodiment of the invention. The access device 702 is in a operational state 704 with the RF power level at a 25 relatively high RF power level compared to the RF power level in the registration state 716. The access device 702 sends a registration request message 708 to the

starts with the device at an operational RF power level 802. The next step 804 is to determine if registration is being initiated. If registration is not being initiated the RF power level will remain at the operational RF power level 802. If registration is initiated, the RF power level is reduced 806 relative to the operational RF power level.

The next step is to transmit the registration initiation message 808 at the low RF power level. Following the registration initiation message, the device receives a registration response message 810. When the registration response message is received the registration of the device is complete and the final step is to restore the power level to operational RF power level 812.

FIG. 9 is a flow diagram 900 of a method of passive registration in accordance with the preferred embodiment of the invention. A device starts with the RF power level being at an operational RF power level 902. The operational RF power level is a relatively high power level in relationship to a registration RF power level.

The next step 904 is to check if the device has received a registration request message. If a registration request message is not received, the RF power level continues at the operational RF power level of step 902. If a registration request message is

We Claim:

CLAIMS

1. A method for registration of a first device
5 having a receiver and a transmitter transmitting at an operational RF power level comprising:
reducing the operational RF power level of the first device to a registration RF power level;
transmitting a registration invitation message
10 from the first device to a second device;
receiving at the first device a registration response message from the second device; and
restoring the first device to the operational RF power level.
- 15 2. A method according to claim 1, wherein the step of reducing the operational RF power level is preceded by a step of activating a switch on the first device.
- 20 3. A method according to Claim 1, wherein the step of reducing the operational RF power level is preceded by a step of expiring of a fixed time interval.
4. A method according to Claim 1, wherein the registration response message contains encrypted data.
- 25 5. A method according to Claim 1, wherein the first device and the second device are located in an in-home wireless network.

a controller coupled to the transmit power control element causing the output power to be switched to the first level when operational signals are provided from the first source and to the second level when
5 registration signals are provided from the second source.

10. An apparatus according to claim 9, further comprising a switch having a first state and a second state, the switch coupled to the second source, wherein
10 the switch in the second state initiates the second source to provide registration signals to the transmitter.

11. An apparatus according to claim 9, further comprising a timer having a fixed interval, the timer
15 coupled to the second source, wherein the timer initiates the second source to provide registration signals to the transmitter.

12. An apparatus according to claim 9, further comprising a receiver coupled to the controller wherein
20 the controller is responsive to receiving a registration request, and initiates the second source to provide registration signals to the transmitter.

13. An apparatus according to claim 9, further comprising a switching means for switching between a
25 first state and a second state, coupled to the second



Application No: GB 9915199.5
Claims searched: 1-13

Examiner: Anita Keogh
Date of search: 17 January 2000

Patents Act 1977 Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:
UK Cl (Ed.R): H4L (LDH, LDSM, LECTS, LECTX)
Int Cl (Ed.7): H04B (7/005), H04M (1/72), H04Q (7/30, 7/32, 7/38)
Other: Online: WPI, JAPIO, EPODOC

Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
Y	US 5592533 (FARRIS et al.) see abstract	3, 11
X, Y	JP 050252097 A (SEIKO) see JAPIO abstract	X: 1, 6, 9 at least Y: 3, 11
X	JP 620222723 A (KOKUSAI ELECTRIC CO LTD) see JAPIO abstract	1, 2, 6, 7, 9, 10, 12, 13 at least

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.